

Does Your Textbook Measure Up?

An Honors Thesis (HONRS 499)

By

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A handwritten signature in black ink that reads "Elizabeth Bremigan". The script is cursive and fluid, with the first name and last name clearly distinguishable.

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Abstract

Teaching is a profession in which the main goal is to help students grow and instill a love of learning. Many times educators cannot choose the textbooks they are required to use in their classrooms. There are drawbacks to almost every textbook series depending on whose opinion you are considering. As teachers we are required to supplement the text and make up for the lacking content areas. While student teaching I was put in exactly that situation. I chose to create a project for my students that I used in addition to the textbook. This article includes my evaluation of the textbook series, the main problem I found in the book, my solution to that problem, and my results. It also includes what I learned throughout this experience and things I would do differently in the future.

Acknowledgements

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I would also like to thank my cooperating teaching and my fifth grade class for allowing me to test my project on them.

Finally, I would like to thank my parents, Michael and Sheri, for their continued support and the amazing opportunity to further my education.

Introduction

As a student of Elementary Education who will soon be graduating from Ball State University I had the opportunity to spend my entire last semester of school in a fifth grade classroom student teaching. Throughout this process I got to experience a lot of things that I did not imagine this job could entail. For me, watching the school go through the process of adopting a new series of basal reading books stood out the most. When a school does this many teachers disagree about which series is the best for the school and they all clearly voice their differing opinions. There are many long meetings and discussions but in the end the school has to come to a consensus and vote for what they believe is the best option. Ultimately though this decision lies with the principal of the school and what he or she thinks is best. That being said not all of the staff in the school will be happy with the decision. Administrators have to go with what is best for the largest majority of people in the school building.

When I first met my cooperating teacher for the semester she showed me some of the textbooks used in her fifth grade classroom. Upon seeing the book chosen by the school for mathematics I was less than thrilled. I could see that my cooperating teacher felt the same way that I did about the series. The school uses a textbook that really lacks a lot of the necessary components to helping students effectively learn all they need in fifth grade math. I personally had never used the textbook series before, but I had done quite a bit of research on it for another class the previous fall. At that point, I realized if I was to get a job in a school with this series I would have to do a lot of supplementing and spend more time when planning my math units and lessons. Of course this is more work for the teacher but the students need it.

Background: The Dilemma

The founders of Saxon Mathematics feel that it is one of the nation's most thoroughly research based instructional programs for grades k-12. This is a non-traditional method but it is standard based (it addresses the Common Core Standards). It is widely used by parents that home school their children. The series offers an immense amount of review for the students. When it comes to the NCTM (National Council of Teachers of Mathematics) content standards I feel as though the series really lacks in the area of measurement. It is covered least out of the five content standards (number and operations, algebra, measurement, geometry, and data analysis & probability). Throughout my experience, though it has been short so far, the students struggle with retaining the measurement information more than they do with other content areas. Measurement is an area where the classroom teacher needs to do a lot of supplementing. My cooperating teacher agreed with me completely on this and mentioned that she herself attempted to do this in the classroom.

When I looked at how well the Saxon series addresses the NCTM process standards (communication, representation, connections, reasoning & proof, and problem solving) I found that the series falls significantly short. It is lacking in almost every process standard and especially so for communication. Being able to communicate mathematical ideas and thinking is very important in helping students to retain information as well as in preparing them for what comes next. I also feel that the series lacks problem-solving skills. Almost all of the examples and problems presented in the textbook are straightforward and leave nothing to the student to figure out or imagine. It is all about applying formulas or solving basic problems. The students also really struggle when I ask them to tell me why they did something or why we can take a

certain short cut. So many of these process standards have been overlooked or placed on the back burner in this series. In order to make up for this teachers have to find alternative activities or create discussion that fulfill these process standards.

Project: The Solution

As a part of my student teaching (and learning) experience I decided that my students really needed some extra work with measurement, and my cooperating teacher agreed. I decided to create a project that focused on perimeter and area—two topics that are strongly addressed in our state-wide ISTEP testing. I wanted the activity to be memorable and engaging in order to spark interest and inspire mathematical conversation.

I began by looking online for ideas but could not find an activity that I thought fit just right or would be interesting to my students. I thought back to a class I had taken on mathematics and technology when we created web quests as one of our projects. That sparked the idea to have the students design their own park. The web quest I had created involved having students create a garden but I felt that the park idea would be more appealing to my fifth graders. The students were free to be creative and include whatever they would like in their park. They would also need to understand some mathematical concepts in order to complete the activity.

My objectives for the project were to have the students design a park using graph paper to identify different sections, determine the perimeter of each section of their park, and determine the area of each section of their park. I really wanted to address the concept of measurement and stick with the very basic aspects the students needed to know. I also wanted there to be real world application so that the students could make connections and better communicate their mathematical reasoning.

The next part was creating the lesson plan and rubric for the project. Here is how I introduced my project to the students.

Task as Given to Students:

“What would you do if you got to create your own park? What would you include? How would you lay it out? What would you put where? What are some things you would have to think about if you were creating a park?”

Have the students brainstorm out loud and bounce ideas off of one another.

“Today we are going to do something very different for math. You will get to design your very own park. You can include anything you like. The math part of the lesson will be when you calculate the perimeter and area of each of your park sections.”

We will begin the lesson by reviewing perimeter and area for about 10 minutes.

“What is perimeter? How do you find it? What if the shape is not a square? What is the area? How do you find it? What if the shape is not a square?”

We worked out some example problems on the board as well (especially the complex shapes or irregular rectangular figures).

Draw a large example on the whiteboard.

“You may divide your park into as many sections as you like but you must have at least 4. I chose seven. In each section I would like you to label it (pool, playground, zoo, etc) and I would also like you to draw and color a picture in each section. You will come up with a name for your park and make that the title of your page. On the backside of your paper you will need to calculate the perimeter and area of each section. Please do not divide any of your graph paper boxes diagonally. This will create halves and will be more difficult for you to calculate the area.”

Write the formulas for perimeter and area on the board. The students have learned how to divide complex shapes into small shapes so that they can find the area. Pass out the graph paper and ask if there are any questions.

I created a rubric that awarded the majority of points for finding the perimeter and area of at least 4 sections of their park correctly. I also gave points for drawing pictures, color, labeling, and a title or name for the park.

Title	0 points for no title		2 points if title is included	
Pictures	1 point if only 1 section includes a picture	2 points if 2 sections include a picture	3 points if 3 sections include a picture	4 points if 4 or more sections include a picture
Color	0 point if there is no color included		2 points if color is included in drawings	
Labels	1 point if only 1 section is labeled	2 points if 2 sections are labeled	3 points if 3 sections are labeled	4 points if 4 or more sections are labeled
Section 1	Did not find perimeter or area 0 points	Found perimeter or area correctly but not both 2 points	Correctly found perimeter and area of this section 4 points	
Section 2	Did not find perimeter or area 0 points	Found perimeter or area correctly but not both 2 points	Correctly found perimeter and area of this section 4 points	
Section 3	Did not find perimeter or area 0 points	Found perimeter or area correctly but not both 2 points	Correctly found perimeter and area of this section 4 points	
Section 4	Did not find perimeter or area 0 points	Found perimeter or area correctly but not both 2 points	Correctly found perimeter and area of this section 4 points	
out of 28 points				

Results

The students were very excited about the activity and started by asking me many questions about what sort of things they were allowed to include. One student also pointed out that the area could easily be found by counting the number of square units within each of their sections. The majority of the class finished in a little over an hour. They did a really great job as a class, and I was very impressed with the quality of work done. This project really helped the students to understand how math can be applied to real world problems or scenarios.

Watching the students work I saw how invested and engaged they were in the lesson, and every one of them used their work time wisely. Almost every park had a different layout that included different sections (dino land, zoo, paintball plex, etc) that it would have never occurred to me to include. The class was split pretty evenly with respect to how they determined the area. Some of them counted; I could see this because they had marked a small dot in each square on their graph paper. Some of them found the length and width and used a formula to find the area. The method they used to find perimeter was mostly split in half as well. Some of the students counted all the way around the section. However, others counted two sides and then added two lengths plus two widths.

Most of the students received between an 80-100% on this assignment. There were about three students who did not pass (two for computation errors and one did not turn the assignment in) and two who received between a 60-80% (also for computation errors). Given that there were twenty-seven students in the class, those are pretty good scores. This let me know who still needed help or did not completely understand the information/process. Most of the points that students missed were in the perimeter/area calculation sections. I noticed that many students miscounted when trying to find the perimeter. When they came to a corner, instead of counting each side of the corner box as two separate units they counted it as one. They earned the points for pictures, color, labels, and a title, which were more based on following directions.

Conclusion

This was a successful supplemental activity, and it was completed with very few misunderstandings. I enjoyed watching my students engage in this activity and helping them in any way I could. I think that they enjoyed the activity as well and were engaged the entire time. Of course there are a few things I will do differently when I use this activity in the future. I think

that it would be beneficial to have some of the students share their work with their classmates. That would help with the mathematical communication that their regular textbook series lacks. I also think I would do a few more example problems on the board with them before assigning the project. I worked out one that was just a rectangle and two that were complex shapes. In the future I would draw a rectangle constructed on a grid to show them how to correctly count the corners when finding the perimeter. I would do the same thing with an irregular rectangular figure.

Some of the student work I received surprised me. I had a few students who divided their park into four equal sections. They only had to find the perimeter and area of one of those sections, and it applied to each of their four sections. They did the bare minimum, but their project met my requirements. I also had students that created as many as twelve sections in their park and then realized that they had to find the perimeter and area of all of those. These are the students that worked up until the last minute. A lot of the students spent more time coloring and decorating than they did determining area and perimeter. These students made some simple mistakes because they were rushing to finish. The students that drew dark lines between the sections of their parks had a much neater product and did not struggle as much determining the perimeter and area. One student colored and drew pictures so neatly you almost could not tell it was on graph paper. Overall, I was very pleased with the outcome.

There are some benefits and drawbacks to creating your own classroom activities. One of the good things is that you can create lessons that address the needs of your specific class and the diverse students you have. You also get to decide how you will use the activity (informal assessment, formal, as a project, homework, a center, etc). Some of the drawbacks are that if you have created this activity you have no idea how it is going to play out in classroom. The first

time you use it your students are testing the project and acting as guinea pigs. You can try your best to foresee possible problems or issues but something will always come up. One of the things I did not consider was that my graph paper was not a standard size (each box was about .6 mm long). One of my students pointed out to me that she was not sure what units to use. I then told the students to simply use “units” and “square units”. I also had forgotten to mention that the students should not draw borders to their sections through the center of any of their graph paper boxes. This would create halves and could complicate their work. Luckily, none of the students did this or even brought it up. However, I did consider that this might be a good challenge for some of the students who have already mastered the skills of perimeter and area. The next time I use this activity it will be revised to fit better with the set of students I have at the time. This was a great starting point and can be developed into an even better project. Creating projects and activities to use in the classroom is an excellent learning experience and a part of this profession that is sometimes forgotten. In my college courses my professors have always stressed that we should not “reinvent the wheel” and that we should “beg, borrow, and steal” from as many teachers as you can. However, sometimes that just does not apply. You have to do what is best for your students and your classroom environment and sometimes that means putting on your thinking cap and making something new.

This entire process has made realize that really great math teachers want their students to fully understand mathematical concepts at or above their grade level. I learned that teachers want their students to be invested in their personal education and to believe it is important. By developing and perfecting our own activities that supplement the textbooks we can get the students interested in necessary skills and concepts that they need to continue their education. After all, that is the reason we all do this job in the first place.

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